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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/722,486	11/28/2003	Masato Hiramatsu	246036US2	3321
22850	7590	04/13/2005	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			KANG, DONGHEE	
			ART UNIT	PAPER NUMBER
			2811	

DATE MAILED: 04/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/722,486

Applicant(s)

HIRAMATSU ET AL.

Examiner

Donghee Kang

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 14 March 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) 5-11 and 19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4 and 12-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 May 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 11/28/03.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Claims 5-11 & 19-19 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 03-14-05.

### ***Priority***

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Information Disclosure Statement***

3. Acknowledgment is made of receipt of applicant's Information Disclosure Statement (PTO-1449) filed November 28, 2003.

### ***Drawings***

4. The drawings were received on 05-10-05. These drawings are acceptable.

### ***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-2, 12-13, 15 & 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamazaki et al. (US 5,962,869).

Re claim 1-2, 12 & 15, Yamazaki teaches a semiconductor structure comprising (Fig.6) a non-single-crystal semiconductor film (602) including a channel region for an active device, and a support substrate (601) that supports the non-single-crystal semiconductor film, the channel region having an oxygen concentration not higher than  $5 \times 10^{17}$  atoms/cm<sup>3</sup> and carbon concentration not higher than  $5 \times 10^{17}$  atoms/cm<sup>3</sup> (Col.12, lines 59-62).

Re claim 13, Yamazaki teaches the active device is a thin-film transistor including source and drain regions (606 & 607) disposed on both sides of the channel region in the non-single-crystal semiconductor film, and a gate electrode layer (604) insulated from the channel region by an insulation film (603).

Re claim 18, Yamazaki teaches a semiconductor structure comprising (Fig.6) a non-single-crystal semiconductor film (602), a support substrate (601) that supports the non-single-crystal semiconductor film, and an active device having a part of the non-single-crystal semiconductor film as a channel region, the channel region having an oxygen concentration not higher than  $5 \times 10^{17}$  atoms/cm<sup>3</sup>. Yamazaki does not explicitly teach a stacking fault (structural defect) density not higher than  $1 \times 10^6$  cm<sup>-3</sup>. However, this feature is inherent in Yamazaki's structure because the oxygen concentration of Yamazaki is also not higher than  $1 \times 10^6$  cm<sup>-3</sup>.

### ***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

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the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki et al. (US 5,962,869) in view of Yamazaki et al. (US 6,492,659).

Yamazaki ('869) does not explicitly teach the channel region is located within a single crystal grain. Yamazaki ('659) teaches increasing the crystal grain size to eliminate the crystal boundaries from the channel forming region to reduce a crystal defects (Col.2, lines 2-16). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the channel region within the single crystal grain by increase the crystal grain size as taught by Yamazaki ('659) in order to remove the crystal grain boundary in the channel region which reduces carrier current so as to obtain a high degree of mobility.

9. Claims 1, 3-4, 12 & 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki et al. (US 2002/0038889) in view of Yamazaki et al. (US 5,962,869).

Re claims 1, 3, 12 & 16, Yamazaki et al. teach a semiconductor structure comprising (Fig.13) a non-single-crystal semiconductor film (236) including a channel region for an active device, and a support substrate (230) that supports the non-single-crystal semiconductor film, the channel region having an oxygen/carbon concentration not higher than  $1 \times 10^{19}$  atoms/cm<sup>3</sup> and metal element with a concentration less than  $1 \times 10^{17}$  atoms/cm<sup>3</sup> (paragraph 0140 & 0160).

Yamazaki et al. ('889) does not teach the oxygen/carbon concentration not higher than  $5 \times 10^{17}$  atoms/cm<sup>3</sup>. Yamazaki ('869) teaches the concentration of oxygen and carbon contained in the crystalline film is set to less than  $5 \times 10^{17}$  atoms/cm<sup>3</sup> (Col.12, lines 59-62). Yamazaki ('869) noted that the electron mobility is significantly improved by reducing the oxygen and carbon concentration of the film (Col.4, lines 1-6). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to reduce the concentration of oxygen and carbon in the film as taught by Yamazaki ('869) since the electron mobility is significantly improved by reducing the oxygen and carbon concentration of the film.

Re claims 4 & 17, Yamazaki ('889) does not explicitly teach the concentration of the metal element is not higher than  $5 \times 10^{16}$  atoms/cm<sup>3</sup>. However, Yamazaki ('889) teaches the concentration of the metal element is less than  $5 \times 10^{17}$  atoms/cm<sup>3</sup>. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select the concentration of the metal element in order to obtain a desired operable device.

### ***Conclusion***

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Donghee Kang whose telephone number is 571-272-1656. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Donghee Kang, Ph.D.  
Primary Examiner  
Art Unit 2811

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